

U.S.S.N. 09/991,341

Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been amended to clarify Applicants disclosed and claimed invention and overcome Examiners objections. The amendments find support in the original claims and/or the Specification.

No new matter has been added.

For example support for amendments in claims 1 and 12 is found in the Specification at paragraph 0041:

"Specifically, referring to Figure 1B, the defect finder mark 30 is disposed on the photomask 10 via the mark installer of the mask marking inspection system. Therefore, the mark installer cuts a cavity defining the defect finder mark 30 into the photomask 10 according to the required size and location for detection by the mask repair device. In the preferred embodiment, the defect finder mark 30 is cut into the mask pattern 14 so that the defect finder mark 30 can be eliminated from the photomask by standard defect repair procedures used in the industry. By deposition on the photomask 10, the defect finder mark 30 reliably facilitates location of the

U.S.S.N. 09/991,341

corresponding defect 55 despite variations in image resolution and photomask positioning or, commonly, "stage movement" between the mask marking inspection system and the mask repair device.

Claim Objections

Claim 11 has been amended to overcome Examiner objection.

Claim Rejections under 35 USC 103

1. Claims 1-5 and 12 stand rejected under 35 USC Section 103(a) as being unpatentable over Machida et al. (US 6,476,913) in view of MacDonald, Jr. et al. (hereinafter MacDonald) (US 4,131,472).

Machida discloses a method and apparatus for displaying images in a circuit inspection system, where an **inspection target region** of an inspection-subject substrate is displayed, and a **designated map picture plane** are displayed in parallel, thereby enabling a defect distribution and a defect image to be simultaneously seen (see Abstract).

Machida discloses an integrated apparatus for viewing a

U.S.S.N. 09/991,341

defect (inspecting conditions), and determining (confirming) a defect, which includes taking an image at the defect position and associating the image with defect position coordinates (see e.g., steps 2-5, Figure 4; steps 205-210, Figure 8; steps 710-711; Figure 27).

In one aspect of the process, the position of a defect may be highlighted on the image display portion by "**marks** such as circles or the like" or small circle points (see Figure 22; col 25, lines 23-28; col 26, lines 54-62)).

In another aspect Machida discloses that in the case common coordinates are not shared by two different apparatus for viewing/inspecting the defect, that a **marking indicative of the position** of the defect or foreign matter may be "written by the appearance inspection apparatus to a near location or the like where the position of the foreign matter or defect may be easily found".

Machida further discloses "or by **marking** in a manner such that the **position** of the defect such as foreign matter, pattern defect, or the like **can be known by the external apparatus** 1024a

U.S.S.N. 09/991,341

such as an **optical inspection apparatus or the SEM inspection apparatus 1024b**" (col 40, lines 27-31).

Machida teaches that defects in a semiconductor device can be detected and fixed during the manufacturing process rather than by the conventional technique of waiting for an abnormality to appear in the product device (col 40, lines 35-54; col 1, lines 26-37).

Machida also teaches that the defect density distribution among shots (a process wafer for manufacturing a semiconductor device) enables detection of a defect in a photomask used in the formation of the pattern, facilitating inspection of the photomask.

Thus, Machida does not disclose a method for photomask inspection and repair, but rather teaches that the defective photomask may be inferred by the defect density distribution related to wafer inspection.

Thus, Machida does not disclose several aspects of Applicants disclosed and claimed invention.

U.S.S.N. 09/991,341

Machida further does not disclose a **mask marking inspection system;**

Rather Machida discloses a conventional defect inspection system that Applicants acknowledge can be used with the method of the present invention.

Nowhere does Machida disclose that the **inspection system has an ability to mark masks or a mark installer linked with the photomask inspection apparatus.**

Nowhere does Machida disclose Applicants step of "disposing a defect finder mark **on the photomask patterned portion** with the mark installer";

In addition, nowhere does Machida disclose or suggest methods or processes for repairing defects or repairing defect finder marks disposed on a photomask patterned portion, including Applicants steps of:

U.S.S.N. 09/991,341

(c) repairing the defect, and

(d) eliminating the defect finder mark.

Moreover, nowhere does Machida recognize or suggest a solution to the problem that Applicants have recognized and solved by their claimed invention.

On the other hand, MacDonald discloses a process whereby a unique set of **index numbers** is added to a photomask for **identification purposes** (see col 3, lines 13-38). A defective chip (completely manufactures) is **back related** to its corresponding photomask in order to locate a defect on the photomask, so that the photomask may be repaired, when possible, **or new photomasks made** (col 5, lines 12-16). MacDonald teaches that the iterative process of finding defective chips **following manufacture** and relating the defective chip to a photomask by indexed numbers, results in the continual iterative improvement of the photomask (col 3, lines 17-28). MacDonald discloses no particular process for finding the defect on the photomask, and nowhere discloses producing a defect finder mark or eliminating the defect finder mark.

U.S.S.N. 09/991,341

Thus, the method of Macdonald works by a different principal of operation than the method of Machida, which is directed to a method to inspect the chip **during the manufacturing process** in order to detect and correct defects prior to completing the manufacture of a chip, while the method of Macdonald is directed at determining defects in **already manufactured chips** and relating back the chip defect to the **probable defective photomasks** by indexing numbers on the photomasks.

Thus, there is no apparent motivation for combining the teachings of Machida and MacDonald. For example the modification of the method of Machida or Macdonald in an attempt to reproduce Applicants invention would destroy the principal of operation of either method and make it unsuitable for its intended purpose.

For example the iterative repair process of MacDonald in repairing defective based on iterative discovery of defective chips **following manufacture**, would make the method of Machida of **inspecting and cataloging defective chips during manufacture** unsuitable for its intended purpose.

U.S.S.N. 09/991,341

Nevertheless, even assuming *arguendo*, a proper motivation for combining the teachings of Machida and Macdonald, such combination does not produce Applicants disclosed and claimed invention.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"A *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention." *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997).

"A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.*, 721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469 U.S. 851 (1984).

U.S.S.N. 09/991,341

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." *In re Ralli*, 270 F.2d 810, 123, USPQ 349 (CCPA 1959).

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

2. Claims 6, 7, and 13-19 stand rejected under 35 USC Section 103(a) as being unpatentable over Machida et al. in view of MacDonald, Jr. et al., as applied above, and further in view of Higashikawa (US 6, 7675, 673).

Applicants reiterate the comments made above with respect to Machida et al. and MacDonald.

Machida et al. do not disclose the step of disposing a defect finder mark on the photomask (including the patterned

U.S.S.N. 09/991,341

portion) or that the step includes "establishing a size for the defect finder mark so that the defect finder mark is detected with a mask repair device."

Higashikawa, on the other hand disclose a method that permits forming a pattern while **avoiding a defective portion** of a **mask blank (unpatterned)** substrate in a photomask (patterned) forming process (Abstract; col 1, lines 61-66). In one aspect, Higashikawa discloses a process for avoiding a defect in transferring the pattern where the pattern position is corrected in the step of exposing (transferring the pattern) to the blank mask to **create a photomask** (col 2, lines 4-14).

In another aspect, Higashikawa discloses forming **position measuring marks** on at least two points **on the main surface** of a **mask blank** (unpatterned mask); then detecting and determining the type of defect on the **mask blank main surface**; then comparing the defect position with the position of the mask pattern **to be formed** on the mask blank to arrange (position) the mask pattern with respect to the mask blank; and then applying an appropriate exposure condition to avoid or minimize the influence of the **defect on the mask blank** (col 2, lines 20-26; col 3, lines 1-10,

U.S.S.N. 09/991,341

lines 12-23).

There is no apparent motivation for combining the teachings of Higashikawa with either Machida et al. or MacDonald. As outlined above, Machida et al. teach a method to **locate defects on a semiconductor device during a manufacturing process**, whereas MacDonald teaches a method for indexing photomasks with identifying numbers so that a defect found in a completed manufactured chip can be **back-correlated** with a photomask used in the manufacturing process.

Higashikawa, on the other hand, generally teaches away from **repairing a defective portion of a photomask**, by teaching a method to **avoid pattern transfer to a defective blank mask portion**.

Thus disclosed processes of each of the references work by a different principal of operation with respect to one another. For example, any attempt to modify Higashikawa, so that the defective portion of a photomask (patterned mask) was first located, marked, and then repaired, would make the method of Higashikawa in locating **positional marks formed on the blank mask**

U.S.S.N. 09/991,341

prior to forming a photomask (patterned mask, unworkable and unsuitable for its intended purpose. On the other hand, both Machida et al. and MacDonald search for defects on an already patterned device, and their methods would not work with the blank mask of Higashikawa.

Nevertheless, even assuming arguendo, a proper motivation for combining the cited references, such combination does not produce Applicants disclosed and claimed invention.

For example, in addition to the failure of the combined references to disclose or suggest Applicants **mask marking inspection system**, nowhere do the references disclose or suggest:

- (b) then disposing a defect finder mark on the photomask patterned portion with the mark installer;
- (c) repairing the defect, and
- (d) eliminating the defect finder mark.

"A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the

U.S.S.N. 09/991,341

claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.,*
721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469
U.S. 851 (1984).

3. Claims 10 and 11 stand rejected under 35 USC Section 103(a) as being unpatentable over Machida et al. in view of MacDonald, in view of Higashikawa as applied above, and further in view of Grenon et al. (US 6,190,836).

Applicants reiterate the statements made above with respect to Machida et al., MacDonald, and Higashikawa.

The fact that Grenon discloses methods for repairing photomask defects does not further help Examiner in establishing a *prima facie* case of obviousness.

Nowhere does Grenon or the combined references disclose forming a defect finder mark including on a patterned portion of a photomask, or eliminating the defect finder mark.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the

U.S.S.N. 09/991,341

reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).

Since the cited references, either singly or in combination, fail to make out a *prima facie* case of obviousness with respect to Applicants independent claims, neither has a *prima facie* case been made out with respect to Applicants dependent claims.

Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.


In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that

U.S.S.N. 09/991,341

necessary action may be taken to place the application in a
condition for allowance.

Respectfully submitted,

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